



CNT Field Emission Electron Gun for Miniature Mass Spectrometry

NASA Case No. GSC-15970-1
NASA Case No. GSC-15844-1
Primary Inventor: Stephanie Getty
Partnership Contact: Enidia Santiago-Arce at
enidia.santiago-arce-1@nasa.gov or
301-286-8497

<http://ipp.gsfc.nasa.gov>

Electrospray ionization is preferred to other types of ionization for analysis of large organic molecules due to its soft ionization characteristics and preservation of molecular structure for mass spectrometer analysis. A carbon nanotube (CNT) field emission electron gun has been developed for an electron impact ionization source of a miniaturized time-of-flight mass spectrometer. The CNT electron gun has applications in chemical analysis of atmospheric gases and regolith samples at Solar System destinations such as Mars, the Moon, and the Outer Planets and their moons, and could also find uses in field-deployable sensors for homeland security and remote Earth Science. Field emission electron sources using the patterned carbon nanotube emitters shown here promise to provide high performance at low power and in a compact footprint. This stacked cathode-grid structure can be adapted to any field emission material that is compatible with microfabrication, making the ultra-clean architecture highly adaptable. This technology development is complementary to current instrument development efforts at GSFC and is expected to be a compelling component of future flight opportunities including the 2018 Mars Mid-range Rover and future Discovery- and New Frontiers-class landed missions to Near Earth Objects.

